COMMENTS TO PROPOSED CHANGES TO CERTIFICATION STANDARDS.

Comment:

From the presentations and discussions last March, it appears that these changes represent a long term goal of significantly increasing the system throughput. Therefore if current DCPs <u>cannot</u> implement these changes, then they simply cannot be assigned on certain channels in the future. Down the road in ? years or so, NESDIS would have to start coordinating the assignments of the first and second generation HDR transmitters to take advantage of the new capabilities. This should certainly not prevent current certified units from being sold and used. However, a date should be floated for discussion as to when the certification specs will become effective, for example say pick a date, Jan 2005 or 2006 or later. Finally, a date for when the 'current' certified transmitters should phase out should be floated, say in 10 years or so.

A TIMING

NESDIS Proposed:

2.1 Self timed Accuracy
+/- 0.1 Second for ALL transmissions 99.9% of the time.

2.12 Inhibiting Transmission
+/- 0.2 seconds from the UTC

COMMENTS:

1) The way this currently reads suggests that 1 out of every 1000 messages could be up to (but not including) 0.2 seconds early or late. (Therefore, the accuracy is really +/- .2 seconds.) It makes no logical sense to allow some transmissions to be late. The transmission time specification should be a fixed time window. This will allow the best utilization by NESDIS to achieve extremely tight TX window assignments in the future.

2) While it is required (proposed) that all DCPRS use GPS (delivering timing accuracy much better than the .1 second specification), the problem arises in the event of short-term GPS outages for whatever reason. Clearly, with GPS out, the system will have to coast on an internal time base. Requiring a .1 second accuracy (over temperature) represents a far greater requirement for the onboard oscillator thereby raising cost and current consumption to achieve more operational time without GPS reception. Current levels of oven controlled oscillators when subjected to the required temperature extremes (of -40C) would find that the .1 second timing accuracy would only be short lived before the system would be out of specification.

Currently the 1200 bps is operating under the 0.5 sec accuracy specification while the 300 bps is under a 30 sec accuracy specification. The majority of customers are currently using HDR on 300 bps (with the sloppy time reporting specification), and they would not likely see GPS based outages. Increasing this specification to the NESDIS proposed .1 seconds will increase the likelihood of a missing message which is totally unacceptable to most customers or alternately raise the cost significantly of the transmitter.

Finally, if NESDIS is trying to address the transponder AGC issue, then consider a small randomization technique about the assigned transmit time.

For this reason, we suggest a specification as follows:

***PROPOSED Specification*   'DCPRS Self-Timed Reporting Mode Accuracy':**

2.1 All DCPRS transmissions shall be within less than or equal to +/- 0.25 seconds of the assigned reporting time (referenced to UTC) over the full range of operating conditions. Should the DCPRS clock differ by *more* than +/- 0.25 seconds, the transmissions are inhibited.

SPECIAL NOTE:
(DELETE THE COMMENT: '<u>within any one year period</u>'. You are either timed to UTC accurately or you are not !!! Continual cumulative drift over several years will cause transmissions to fall out of time slots and collide.)

2.1.2 Inhibiting Transmissions (Delete this section. See above)

Final note: We believe that requiring GPS as the timing source is a logical solution to a potential problem of using different timing sources. The advantage of a single source is the handling of time changes (Leap seconds/year) and excellent timing accuracy for all locations. In the event of some time standard becoming obsolete in the future, then at least all transmitters reporting will be on the same physical clock and not on different systems.

B DATA FORMAT

3.1 Data Format.

We agree with all changes except the max message length (see section on failsafe). All of the lengths proposed below are failsafe friendly at 110 seconds. Also, they are nice 8 bit byte increments. Under the field of 'DCP DATA' change the 'MAX' number of bits to:

PROPOSED CHANGE:

'MAX DCP DATA'

100 bps = 9600 bits
300 bps = 32,000 bits
1200 bps = 128,000 bits

Comment:

1) Do not see any real advantage to inserting the message length field in place of FSS. If customer desires this information, it may be included in the data field.

C DATA SCRAMBLING

Data Scrambling:

OK.

D ENCODER FLUSH

Encoder Flush:

OK. As long as interleavers are thrown away.

E INTERLEAVER

Interleaver:

OK.

Comment: No evidence of improvement with interleavers. Short messages become particularly long if not aware of the consequences of FSS selection. (Maybe more testing is necessary for this?.) Don't really have an issue to leave them alone in the event there is some application that could use them in the future.

F PROHIBITED CHARACTERS

Prohibited Characters:

OK. Only EOT.

Binary Format:

Will comment soon.

G EOT

EOT:

OK.

H MESSAGE LENGTH

Message Length:

OK. See comments above about a suggested non-conflicting solution.

I FREQUENCY ADJUSTMENT

Frequency Adjustment:

OK.

J RF POWER OUTPUT

RF Power Output.

OK on the proposed EIRP levels.

Comment:

1. However, it may still be a good idea to recommend a nominal RF power setting as before for ambient conditions. For example, if manufacturers achieve .25 dB total control on RF power output over temp, then all manufacturers could set their systems up to operate at just under +50 EIRP (at 300bps) thereby changing the loading calculations.
2. User capability to adjust the RF power is risking ‘accidental’ misuse of power uplinked. Serious overpower situations could occur causing various overload problems. Certified combinations of transmitters at fixed wattages and antennas should be used for most fool proof operation.

K FREQUENCY (channel) REQUIREMENTS

Frequency Requirements.

OK.

This represents one of the easiest possible changes on the transmitter and demodulator to achieve more system capacity.

L FREQUENCY STABILITY

Frequency Stability.

NO!! as proposed

PROPOSE: +/- 75 Hz over all operating conditions.

The proposal to change from +/- 425 Hz to +/- 30 Hz is too restrictive. Certainly reducing the frequency drift will assist with keeping the transmission within the new proposed window, but this is too tight. Once again, this will either raise the cost significantly on the transmitter or require excessive dependence on the GPS signals.

Currently, our transmitters use low cost technology and easily achieve better than 25 Hz over temperature, however, we feel that loosening the tolerance will permit more tolerance to temperature extremes and GPS or other timing outages. This will help insure no missing data under most all conditions, one of the customer's most important demands.

M MODULATOR STABILITY

Modulator Stability.

OK.

N PHASE NOISE

Phase Noise.

OK.

O NARROWBAND TRANSMIT SPECTRUM

Narrowband Transmit SpectrumFiltering: (Suggest changing this title to: '<u>Required Transmit Spectrum Filter</u>')

OK..

Comment:

1. Filtering the transmit spectrum with the Square-Root Raised Cosine (SRRC) filter with a=1 is the ***best possible*** filtering approach. A=1 is perfect for minimizing the Peak-to-average Ratio and secondly allowing for easier demodulation. While narrower spectrums could be achieved with smaller alphas, we feel that there is spectrum space for the a=1 while easing all other problems. USE FOR 300 and 1200 BPS.

2. All of our transmitters are capable of the SRRC filters now and easy (downloadable) upgrades to earlier generation transmitters are possible if that was desired. *Next to changing the channel definitions, this is the easiest possible change to the transmitter and demodulator helping to achieve the increase of capacity*. Testing has indicated improved performance using this filter.

3. Clarify the Mask wording: -25 dB for frequencies removed from the carrier frequency of 75% of the necessary bandwidth to 150% of the necessary bandwidth, and -35 dB from 150% to 300% of the necessary bandwidth, etc.

O Narrowband Transmit Spectrum Filtering MASK.

Narrowband Transmit Spectrum:

OK

Comment:

1)Clarify the necessary BW = 2*Rs.
2) In the appendix give an example screen shot showing the modulated waveform with the mask drawn on top and example values read off. This would help remove any misunderstandings.

P MIDBAND SPECTRUM

Midband Spectrum:

OK

Comment: Clarify with "require all emissions greater than 300% of the necessary bandwidth be down by 43 + 10*LOG(Power in watts) "

Q FAILSAFE LENGTH

Failsafe Length:

Currently both message lengths are in the 105 to 106 second range and would potentially trip the 105 second failsafe unless SW prevention is designed in… I am not sure as to the origins of the 105 second window, but in the event that this particular amount of data is critical, then here is a suggestion to round up to simple numbers for the data field lengths of 4K and 16K (for 300 and 1200 bps respectively) and a common FS time of 110 seconds. This would have a 'safety' region designed in to prevent tripping of the failsafe.

Suggest the following:

baud	Data Bits	Data (Bytes)	total # of all bits transmitted (no carrier)	Total TX time plus carrier seconds	Failsafe (suggested) seconds
100	9600	(1,200)	9,694	97.44 *	110
300	32,000	(4,000)	32,098	107.493	110
1200	128,000	(16,000)	128,098	106.998	110

* 5 Second Carrier no longer permitted. (Yes, the 100 bps was included here as they may operate for 6 more years or so.)

Test Notes

A draft will be created for discussion.